slender, sclerotized stalk, or petiole, by which it is joined to the mesal portion of the parameral base. No other muscle fibres were discovered attached to the volsellar cuspes of these males, so it is assumed that this recovery is due entirely to the action of the resilient petioles.

The muscle fibres were stained with Van Gieson's Connective Tissue Stain while they were submerged in alcohol. This useful stain consists of 7.5 cc. of 1% acid fuchsin with 50 cc. saturated aqueous picric acid. It is not a very persistent stain, but will permeate the muscle fibres long enough to facilitate their observation and identification.

No other member of this family which has been dissected to date has male phallic structures resembling those of *Priacma.* Other genera examined include *Tetraphalerus*[2], *Cupes,* and *Omma*[3].

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[2] Illustrated in the following publication: Monros, F. and M. *Las especies Argentinas de Cupedidea.* Anal. Soc. Cient. Argentina, vol. 154, pp. 19-41, 30 figs. 1952.

[3] Illustrated in the following publication: Sharp, D. & Muir F. *The comparative anatomy of the male genital tube in Coleoptera.* Trans. Ent. Soc. London, 1912, pp. 477-642, 36 pls. 1912.

BIOLOGICAL NOTES ON TRIRHABDA FLAVOLIMBATA

(Chrysomelidae)

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The species *Trirhabda flavolimbata* (Mannerh.) has been found feeding in the larval stage on various composites and upon plants belonging to other families as well. Known host plants are *Artemisia, Solidago, Senecio, Aster,* and *Baccharis,* among the composites. Blake (1931, pages 1-36), in her revision of the genus, records it from *Baccharis pilularis* in the vicinity of Searsville Lake, near Stanford, Santa Clara County, California, and in smaller numbers on *Eriodictyon* (Hydrophyllaceae).

In the coastal region of California it is abundant on *Baccharis pilularis* and is by far the most common and destructive chrysomeloid on this plant. Next to the moth *Bucculatrix variabilis* Braun, it is the most important defoliator of *Baccharis* in this area.

First instar larvae were found in February of 1946, 1947, and 1948. Larvae removed to the laboratory on February 23 measured 3.5 mm. in length and were unicolorous black. Ecdysis took place on February 27, and the larvae then measured 4.55 mm. and retained the black coloration. Thirteen specimens under study all molted within twenty-four hours of each other.

The third instar was assumed on March 7, and on March 10 the larvae measured 10.3 mm. (average of 13). The color change with this molt was from grayish black in some specimens to iridescent bluish green in others. It was found that larval color in the older larvae is extremely variable, whereas the young larvae are always black. The larvae are 11 to 16 mm. in length when mature. While feeding, the larvae are decidedly sluggish and sedentary, but just previously to pupation they became restless and wander from the food to the ground. Iridescent individuals become dull in color at this time, perhaps because of the loosening of the cuticle previous to the prepupal molt.

After a period of time that varies from two hours to two days, the larva enters the soil to a depth of from one to four centimeters, and forms a cell. No secretions are used, the cell being merely a cavity in the soil. The larva curls in this cell, head to anus, and after a period of time that averages five days, the last larval skin splits dorsally and is worked back to the anal end of the body, revealing the pupa. The pupa is at first colorless and soft, with appendages very little developed, though present. The beetle becomes pigmented and developed in 8 days on the average, while extremes were 6 to 13 days.

The beetle then rests in the cell, moving the appendages slowly, for not less than two days. At the end of this time, which serves apparently to harden the appendages, the beetle begins to dig with its mandibles, lifting the soil and depositing it behind itself, or pushing it aside. In many cases where larvae were reared in individual glass vials, pupation occurred near the side of the vial, and all of the behavior of the insect could be seen, from the time of soil entry to emergence as an adult.

After emergence from the soil, the newly emerged adult climbs the plant and sits on a tip for some time, often a day or two, without feeding. Feeding consists of eating into leaves from the edges, the palpi being used constantly to feel the edges of the plant and, it would seem, to guide the mandibles. The edge of the leaf is palpated until one palpus of each pair is on each side of the leaf, and then the mandibles are brought into play. The beetles often foul the leaves on which they are feeding, but then refuse to eat the material so contaminated. This habit results in the necessity of frequent food changes in the laboratory, both to insure sufficient food and to prevent mold growth in the vials.

Four pairs of the adults from the previous rearing were placed in a large jar and fed and observed daily. All had emerged on April 17-18 after pupal periods averaging 8 days, plus a period of four or five days spent in hardening the appendages and digging out of the cells. Little feeding took place during the first two days, but on the third day they began to feed avidly and continued to do so up to April 23. On this date one pair was found in copula and was removed to a separate container. For seventeen days, up to May 9, no oviposition was observed, though the female became gradually gravid. On the afternoon of May 9, the female was found at the base of the food branch, at the point where the branch had been thrust into moist soil. The abdomen was inserted into the ground along side of the branch. This process was alternated with periods of feeding until May 15. Then the beetles were removed to another container and the twig examined. Numerous eggs were found in small clusters just below the surface of the soil.

The eggs are oval in form, from 1.1 to 1.2 mm. in length. They are yellow when first laid, drying to pale brown, and are roughly and coarsely reticulated, ornamented with raised tubercles, and covered with a thick tough chorion.

This female lived for a period of fifty-four days, up to June 9, and laid a total of seventy-three eggs. Another female of the same generation lived for 68 days but laid only 43 eggs, unless some were overlooked. No eggs were found above ground. The eggs remained without hatching until the project had to be abandoned, but many of them contained well-formed embryos. It would appear from this that eggs laid during the spring do not hatch until the following February. There would appear to be but one scattered brood, and a long period of oviposition seems to account for the long seasonal occurrence of larvae. The drier part of the year is passed in the egg, although adults live for a long time and may possibly overwinter once. Occasional adults may be taken late in the year, far past the peak population, which is reached in May and June. Since four instars were undergone in the laboratory by the most minute of the field-taken larvae, it would appear that the number of instars is five. No parasites were reared.

Defoliation by this beetle was frequently observed. At Pilarcitos Creek, San Mateo County, plants defoliated by *Bucculatrix* in January were again defoliated by *Trirhabda* in March and April, by which time the plants had scarcely recovered from the attacks of the moth. Observations at later dates on these same plants showed that they were not killed, but recovery was poor and growth was thin and scanty. Many *Baccharis* shrubs show a scraggly growth that is due to the combined attacks of these two species.

Plants that have a heavy infestation of black scale, *Saissetia oleae* (Bernard), in addition to having been attacked by both *Trirhabda* and *Bucculatrix*, may be seriously injured or killed. These declining plants are very subject to the attack of *Chrysobothris bacchari* Van Dyke, while plants that are actually dying are attacked by *Psoa maculata* LeConte. This sequence seems to be a common one in normal stands of *Baccharis pilularis*, and a normal part of the succession in the area.

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CURRENT LITERATURE

Compiled by ROSS H. ARNETT, JR.

This section is designed to contain all papers on the Coleoptera of North and South America which are not in the **Catalogue of the Coleoptera of America, North of Mexico** and its supplements, or in the **checklist of the Coleopterous Insects of Mexico, Central America, the West Indies, and South America** and which have not been previously listed in The Coleopterists' Bulletin.

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